

## WATERSHED MANAGEMENT AREA 10

### MILLSTONE RIVER DRAINAGE

The watershed management area includes watersheds draining the northern coastal plain of New Jersey. Bedens Brook, Stony Brook, Cranbury Brook and Devils Brook all flow into the Millstone which in turn is a tributary to the Raritan River. The area lies in parts of Hunterdon, Somerset, Middlesex, Mercer and Monmouth Counties and includes the following principal watersheds:

Millstone River

Stony Brook

Bedens Brook

#### Summary of ambient physical/chemical monitoring stations and classifications

##### Station

##### Classification

Millstone River near Manalapan

FW-2 Nontrout

Millstone River at Grovers Mill

FW-2 Nontrout

Stony Brook at Princeton

FW-2 Nontrout

Bedens Brook near Rocky Hill

FW-2 Nontrout

Millstone River at Blackwells Mills

FW-2 Nontrout

Note: Monitoring sites at Millstone River at Kingston (FW-2 Nontrout) and Millstone River at Weston (FW-2 Nontrout) were discontinued in 1991.

#### OVERALL MANAGEMENT AREA ASSESSMENT

##### - Swimmable Support Status:

##### WATERWAY

##### LOCATION

##### STATUS

Millstone River

near Manalapan

Partial Support

Millstone River

at Grovers Mill

Partial Support

Stony Brook

at Princeton

Partial Support

Bedens Brook

near Rocky Hill

Partial Support

Millstone River

at Blackwells Mills

No Support

- **Summary of Aquatic Life Support Status (Number of stations within each assessment category).** Note: See the Biological Assessment Table located at the end of this section for details regarding macroinvertebrate assessments within the watershed management area.

No Impairment: 4

Mod. Impairment: 31

Severe Impairment: 2

**MAPS here**

## MILLSTONE RIVER

### WATERSHED DESCRIPTION

The Millstone River drains an area of 271 square miles, including parts of Hunterdon, Somerset, Middlesex, Mercer and Monmouth Counties. This river is 38 miles long and flows from Millstone Township in Monmouth County to the Raritan River near Manville and Bound Brook. Most of the lower half of the river flows adjacent to the Delaware and Raritan Canal. The population centers in this drainage basin are Princeton Township and Borough, Manville, South Brunswick Township, East and West Windsor Townships, Hightstown and Pennington Boroughs. Major tributaries include Stony Brook (21 miles), Cranbury Brook, Bear Brook, Ten Mile River, Six Mile River and Bedens Brook (10 miles). The largest impoundment in this area is Carnegie Lake in Princeton Township, but there are a large number of smaller lakes in the watershed.

The land use in the Millstone watershed is primarily suburban development with scattered agricultural areas. Extensive and recent development is present in the Upper Millstone watershed. Of the over 40 NJPDES permitted dischargers here, approximately half are municipal and half industrial/commercial. All surface waters in the Millstone basin are classified as FW-2 Nontrout.

### WATER QUALITY ASSESSMENT

#### Physical/Chemical Water Quality

##### Locations: Millstone River near Manalapan

**Dissolved Oxygen:** Acceptable for nontrout waters.

**Temperature:** No violations of the upper criterion for non-trout waters.

**Nutrients:** Low to moderate levels. Inorganic nitrogen ( $\text{NO}_2 + \text{NO}_3$ ) is marginal, with a median of 1.245 mg/l and no values recorded at or above 2.0 mg/l. Total phosphorus is slightly elevated, with a median of 0.07 mg/l and 25% of values exceeding the criterion of 0.10 mg/l.

**Bacteria:** Slightly elevated. The geometric mean is 72.7 MPN/100 ml and 15% of samples exceeded the 400 MPN/100ml criterion.

**Heavy Metals:** One of the four lead samples collected during the period of review exceeded the chronic aquatic life criterion. In addition, one zinc sample (again of four) closely approached, but did not exceed, the acute and chronic criteria for zinc.

**Locations: Millstone River at Grovers Mill and at Blackwells Mill**

**Dissolved Oxygen:** Problematic at Grovers Mill where one (5%) sample was recorded below the 4.0 mg/l criterion and one other sample closely approached this limit. Acceptable at Blackwells Mill.

**Temperature:** No violations of the upper criterion for non-trout waters.

**Nutrients:** Phosphorus levels were elevated at both locations. Grovers Mill showed a median of 0.13 mg/l, with 85% of samples exceeding the 0.05 mg/l criterion for waters upstream of impoundments (65% were over 0.1 mg/l). At Blackwells Mill, levels were higher, with the median at 0.25 mg/l and 94% of samples violating the 0.1 mg/l criterion.

Inorganic nitrogen ( $\text{NO}_2 + \text{NO}_3$ ) is very high at Grovers Mill. The median was 3.6 mg/l, with 4 of the 18 samples exceeding 5 mg/l. Blackwells Mill showed lower nitrogen levels; the median was 2.0 mg/l.

**Bacteria:** Mild elevations at both location, with Blackwells Mill, the more downstream location, showing slightly poorer sanitary quality of the two locations. Grovers Mill produced a geometric mean of 132 MPN/100 ml and 20% of samples violated the 400 MPN/100ml criterion. At Blackwells Mill, the geometric mean was 208 MPN/100 ml, with 17% of samples exceeding the 400 MPN/100ml criterion.

**Heavy Metals:** Both locations showed elevated lead. Grovers Mill had one sample (of a total of five) exceeding the chronic aquatic life criterion, and a second sample, at 110 ug/l, exceeds both acute and chronic criteria. This is a very high level and a quality assurance check should be made to verify the validity of the sample. In addition to elevated lead, Grovers Mill had exceedances of cadmium (one of five samples). At Blackwells Mill, two of seven samples exceeded the chronic criterion for lead.

**Comment:** These data appear to reflect an improvement in water quality at Grovers Mill that occurred around the spring of 1992. Total phosphorus, instream BOD, dissolved oxygen, and possible fecal coliform bacteria, all appear to have improved around that time period.

**Locations: Bedens Brook near Rocky Hill**

**Dissolved Oxygen:** Acceptable.

**Temperature:** No violations of the upper criterion for non-trout waters.

**Nutrients:** Inorganic nitrogen ( $\text{NO}_2 + \text{NO}_3$ ) is marginally acceptable; the median value is 1.6 mg/l, and 28% of samples exceeded 2.0 mg/l. Total phosphorous is elevated, with 50% of samples exceeding the criterion; the median value is 0.105 mg/l.

**Bedens Brook near Rocky Hill continued:**

**Bacteria:** Sanitary quality is marginally acceptable. The geometric mean of fecal coliform bacteria was 163 MPN/100ml and 25% of samples exceeded the 400 MPN criterion.

**Heavy Metals:** One of three lead samples violated the aquatic life chronic criterion.

**Other:** The upper pH criterion was exceeded in 10% of samples.

**Locations: Stony Brook at Princeton**

**Dissolved Oxygen:** Acceptable.

**Temperature:** No violations of the upper criterion for non-trout waters.

**Nutrients:** Inorganic nitrogen ( $\text{NO}_2 + \text{NO}_3$ ) is acceptable. The median was 0.625 mg/l, with almost all samples below 1.0 mg/l. Total phosphorous is elevated, with 70% of samples exceeding the 0.05 mg/l impoundment criterion; the median value is 0.085 mg/l.

**Bacteria:** Sanitary quality is marginally acceptable. The geometric mean of fecal coliform bacteria was 77 MPN/100ml and 15% of samples exceeded the 400 MPN criterion.

**Sodium:** One wintertime sample (out of 20) exceeded the drinking water criterion for sodium.

**Other:** Twenty-eight percent of samples exceeded the upper pH criterion. The reasons are not currently clear but vigorous photosynthetic activity is suspected. This location has been known in the past for supersaturated dissolved oxygen conditions, believed to be brought about by nutrient enrichment leading to excessive algal production.

**Summary:** Nutrient enrichment, as reflected in total phosphorus, varies in the Millstone from mild as observed near Manalapan to severe downstream at Blackwells Mill. The pattern for inorganic nitrogen is different, moderate (but acceptable) near Manalapan, very high at Grovers Mill, and lower again at Blackwells Mill. Grovers Mill shows severely depressed dissolved oxygen in the summer and fall. Sanitary quality to some extent mirrors phosphorus where upstream near Manalapan conditions show mildly elevated bacterial levels, rising a bit at Grovers Mill, and becoming unacceptable at the downstream-most station at Blackwells Mill. Elevated lead appears to be a problem at all three monitoring locations. In addition, violations were recorded near Manalapan for zinc and at Grovers Mill for cadmium. As mentioned above, the monitoring location at Grovers Mill indicates that there are improvements in water quality occurring around the spring of 1992.

Compared to the previous assessment period (1986 through 1990), the Manalapan site has not changed. Grovers Mill has improved with respect to BOD, dissolved oxygen, total phosphorus and sanitary quality. Lead and

chromium violations appear to come and go through various assessment periods here. Conditions at Blackwells Mill may have improved slightly with regard to total phosphorus and sanitary quality.

Bedens and Stony Brook both have marginally acceptable sanitary quality and elevated total phosphorus. Algal growth is suspected to be behind the elevated pH recordings that both locations exhibit - 10% of samples at Bedens Brook and 28% at Stony Brook. Compared to earlier assessments, there may have been a slight improvement in the overall quality in the Bedens Brook. Stony Brook may have undergone an improvement in its sanitary quality.

### **Biological Monitoring**

See the Biological Assessment Table located at the end of this section for details regarding macroinvertebrate assessments within the watershed. With some exceptions, macroinvertebrate studies have led almost the entire Millstone watershed to be assessed as moderately impaired. Waterways assessed include the Millstone itself, Cranbury Brook, Bear Brook, Devils Brook, Rocky Brook, Stony Brook, Royce Brook, Rock Brook, Bedens Brook and Heathcote Brook. Non-impaired conditions were assessed in the Millstone River at Bergen Mills, Camp Harmony Brook, Crusier and Back Brooks. Severely impaired conditions were encountered at the lower end of Heathcote Brook and in Duck Pond Run.

### **POINT SOURCE ASSESSMENT**

Treatment plant effluents from the Hightstown and East Windsor plants had been major contributors to dissolved oxygen and nutrient problems in the Millstone River. In response, the Hightstown treatment plant has undergone a substantial upgrade and the East Windsor plant has now been completely replaced with a new "state of the art" facility.

The following wastewater treatment plants have either ceased discharging or are being upgraded:

FACILITY	LOCATION	RECEIVING STREAM	COMMENTS
GSA Depot	Hillsborough Twp., Somerset Co.	Pike Run	Facility has ceased discharging.
Stony Brook RSA	Princeton Twp.	Millstone River	ACO executed with a compliance schedule for the facility to provide additional treatment on its wet weather overflow discharge line. Construction is nearing completion.

### **NONPOINT SOURCE ASSESSMENT**

The predominant nonpoint pollution sources in the Millstone watershed are those associated with suburban development which had been reported to be on the increase throughout the watershed. Runoff from construction sites, suburban surfaces, storm sewers and roads are contributing to excessive sediment loading. Septic systems are also believed to be a potential pollution problem throughout the watershed. In the upper reaches of the Millstone River, this source may also be a threat to the ground water.

Nonpoint pollution associated with agriculture is limited in this watershed to the regions drained by Etra and Peddie lakes, Cranbury Brook, and the lower reaches of the Millstone near its confluence with the Raritan River.

Sediments, nutrients, and pesticides are suspected of coming from croplands, and are believed to be severe in the East Windsor area where chronic fish kills have occurred in the past. It is a combination of agricultural and urban runoff that is suspected of degrading the fish communities in the upper Millstone River.

Other nonpoint pollution sources have been reported in the Millstone watershed. Fuel oil spills have occurred in the Upper Millstone, causing fish kills. Landfills are assessed as problems, both in the upper watershed where recreational usage and ground water are impacted and in South Brunswick where leachate from a municipal landfill has been noted by local authorities as a problem.

### **DESIGNATED USE ASSESSMENT**

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The monitored waters of the Millstone River are classified as partially supporting primary contact recreation (swimming) near Manalapan and at Grovers Mill. The river does not support the use at Blackwells Mill because of excessive fecal bacteria concentrations. Bedens Brook near Rocky Hill and Stony Brook at Princeton both partially support the use.

With exceptions such as the Millstone at Bergen Mills where it is non-impaired, the entire watershed partially supports the aquatic life designated use.

## BIOLOGICAL ASSESSMENT TABLE: AREA 10

Mgt Area	Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
10	34	AN0378	Millstone R	Baird Rd	Millstone Twp	Jul 25, 1990	non-impaired
10	34	AN0378	Millstone R	Baird Rd	Millstone Twp	Oct 7, 1992	moderately impaired
10	34	AN0378	Millstone R	Baird Rd	Millstone Twp	Jan 21, 1993	severely impaired
10	34	AN0378	Millstone R	Baird Rd	Millstone Twp	Apr 8, 1993	moderately impaired
10	34	AN0379	Millstone R	Rt 33	Bergen Mills	Jul 25, 1990	non-impaired
10	34	AN0380	Rocky Bk	Perrineville Rd	Perrineville	Aug 31, 1993	moderately impaired
10	34	AN0381	Rocky Bk	Rt 33	Hightstown	Oct 6, 1993	moderately impaired
10	34	AN0382	Millstone R	Grovers Mills Rd	Grovers Mills	Jul 24, 1990	moderately impaired
10	34	AN0383	Bear Bk	Old Trenton Rd (Rt 535)	W Windsor Twp	Oct 7, 1993	moderately impaired
10	34	AN0384	Bear Bk	Stobbe Ln	Princeton Jct	Jul 23, 1990	moderately impaired
10	34	AN0385	Cranbury Bk	Applegarth Rd	Monroe Twp	Jul 25, 1990	moderately impaired
10	34	AN0386	Cranbury Bk	Edgemere Ave	Plainsboro	Jul 24, 1990	moderately impaired
10	34	AN0387	Devils Bk	New Rd	S Brunswick Twp	Oct 6, 1993	moderately impaired
10	34	AN0388	Shallow Bk	N of Scotts Cor	S Brunswick Twp	Oct 6, 1993	moderately impaired
10	34	AN0389	Devils Bk	Schalk's Rd	Plainsboro	Oct 6, 1993	moderately impaired
10	34	AN0390	Camp Harmony Br	Van Dyke Rd	Hopewell Twp	Apr 5, 1994	non-impaired
10	34	AN0391	Stony Bk	Mine Rd	Hopewell Twp	May 10, 1982	non-impaired
10	34	AN0391	Stony Bk	Mine Rd	Hopewell Twp	May 13, 1987	non-impaired
10	34	AN0391	Stony Bk	Mine Rd	Hopewell Twp	Aug 25, 1987	moderately impaired
10	34	AN0391	Stony Bk	Mine Rd	Hopewell Twp	Oct 29, 1987	non-impaired
10	34	AN0391	Stony Bk	Mine Rd	Hopewell Twp	Apr 27, 1994	moderately impaired
10	34	AN391A	Stony Bk	Linvale Rd	Amwell Twp	May 14, 1987	moderately impaired
10	34	AN391A	Stony Bk	Linvale Rd	Amwell Twp	Aug 25, 1987	moderately impaired
10	34	AN391A	Stony Bk	Linvale Rd	Amwell Twp	Oct 29, 1987	moderately impaired
10	34	AN0392	Stony Bk	Old Mill Rd	Pennington	May 13, 1987	moderately impaired
10	34	AN0392	Stony Bk	Old Mill Rd	Pennington	Aug 25, 1987	non-impaired
10	34	AN0392	Stony Bk	Old Mill Rd	Pennington	Oct 29, 1987	non-impaired
10	34	AN0392	Stony Bk	Old Mill Rd	Pennington	May 12, 1994	moderately impaired

# **BIOLOGICAL ASSESSMENT TABLE continued:**

Mgt Area	Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
10	34	AN392A	Stony Bk	Pennington-Rocky Hill Rd	Hopewell Twp	May 10, 1982	moderately impaired
10	34	AN0393	Stony Bk	Rt 206	Princeton Twp	May 10, 1982	non-impaired
10	34	AN0393	Stony Bk	Rt 206	Princeton Twp	May 12, 1987	moderately impaired
10	34	AN0393	Stony Bk	Rt 206	Princeton Twp	Aug 25, 1987	moderately impaired
10	34	AN0393	Stony Bk	Rt 206	Princeton Twp	Oct 27, 1987	moderately impaired
10	34	AN0393	Stony Bk	Rt 206	Princeton Twp	Jul 23, 1990	moderately impaired
10	34	AN0393	Stony Bk	Rt 206	Princeton Twp	Apr 12, 1994	moderately impaired
10	34	AN393A	Stony Bk	Province Line Rd	Princeton Twp	May 10, 1982	moderately impaired
10	34	AN393A	Stony Bk	Province Line Rd	Princeton Twp	May 12, 1987	non-impaired
10	34	AN393A	Stony Bk	Province Line Rd	Princeton Twp	Aug 25, 1987	non-impaired
10	34	AN393A	Stony Bk	Province Line Rd	Princeton Twp	Oct 27, 1987	non-impaired
10	34	AN393B	Stony Bk	Carter Rd	Lawrence Twp	May 10, 1982	moderately impaired
10	34	AN0394	Duck Pd Run	Rt 1	W Windsor Twp	Apr 12, 1994	severely impaired
10	34	AN0395	Heathcote Bk	Stouts Ln	S Brunswick Twp	Oct 6, 1993	moderately impaired
10	34	AN0396	Heathcote Bk	Academy St	Kingston	Oct 6, 1993	severely impaired
10	34	AN0397	Millstone R	off Rt 27	Kingston	Oct 6, 1993	moderately impaired
10	34	AN0398	Beden Bk	Aunt Molly Rd (abv STP)	Hopewell Twp	May 14, 1987	moderately impaired
10	34	AN0398	Beden Bk	Aunt Molly Rd (abv STP)	Hopewell Twp	Aug 26, 1987	non-impaired
10	34	AN0398	Beden Bk	Aunt Molly Rd (abv STP)	Hopewell Twp	Oct 30, 1987	moderately impaired
10	34	AN0398	Beden Bk	Aunt Molly Rd (abv STP)	Hopewell Twp	Apr 5, 1994	moderately impaired
10	34	AN0399	Rock Bk	Long Hill Rd	Zion	Apr 5, 1994	moderately impaired
10	34	AN0400	Rock Bk	Burnt Hill Rd	Montgomery Twp	Apr 5, 1994	moderately impaired
10	34	AN0401	Beden Bk	Rt 206	Montgomery Twp	Apr 22, 1982	moderately impaired
10	34	AN0401	Beden Bk	Rt 206	Montgomery Twp	May 14, 1987	non-impaired
10	34	AN0401	Beden Bk	Rt 206	Montgomery Twp	Aug 26, 1987	non-impaired
10	34	AN0401	Beden Bk	Rt 206	Montgomery Twp	Oct 29, 1987	non-impaired
10	34	AN0401	Beden Bk	Rt 206	Montgomery Twp	Apr 5, 1994	moderately impaired
10	34	AN401A	Beden Bk	abv Rock Bk confl	Montgomery Twp	May 14, 1987	non-impaired

# **BIOLOGICAL ASSESSMENT TABLE continued:**

Mgt Area	Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
10	34	AN401A	Beden Bk	abv Rock Bk confl	Montgomery Twp	Aug 26, 1987	non-impaired
10	34	AN401A	Beden Bk	abv Rock Bk confl	Montgomery Twp	Oct 30, 1987	non-impaired
10	34	AN401B	Beden Bk	Great Rd	Blawenburg	May 14, 1987	moderately impaired
10	34	AN401B	Beden Bk	Great Rd	Blawenburg	Aug 26, 1987	non-impaired
10	34	AN401B	Beden Bk	Great Rd	Blawenburg	Oct 30, 1987	moderately impaired
10	34	AN401C	Beden Bk	Aunt Molly Rd (blw STP)	Hopewell Twp	May 14, 1987	moderately impaired
10	34	AN401C	Beden Bk	Aunt Molly Rd (blw STP)	Hopewell Twp	Aug 26, 1987	non-impaired
10	34	AN401C	Beden Bk	Aunt Molly Rd (blw STP)	Hopewell Twp	Oct 30, 1987	moderately impaired
10	34	AN0402	Pike Run	Rt 206	Belle Mead	Nov 10, 1993	moderately impaired
10	34	AN0403	Cruser Bk	Rt 206	Montgomery Twp	Nov 10, 1993	non-impaired
10	34	AN0403	Cruser Bk	Rt 206	Montgomery Twp	Aug 2, 1994	non-impaired
10	34	AN0403	Cruser Bk	Rt 206	Montgomery Twp	Nov 3, 1994	non-impaired
10	34	AN0403	Cruser Bk	Rt 206	Montgomery Twp	Feb 14, 1995	non-impaired
10	34	AN0404	Back Bk	Rt 206	Montgomery Twp	Jun 14, 1994	non-impaired
10	34	AN0405	Pike Run	Rt 533	Montgomery Twp	Apr 5, 1994	moderately impaired
10	34	AN0406	Simonson Bk	Canal Rd	Griggstown	Oct 5, 1993	moderately impaired
10	34	AN0407	Ten Mile Run	Canal Rd	Franklin Twp	Oct 5, 1993	moderately impaired
10	34	AN0408	Six Mile Run	Rt 27	Franklin Twp	Oct 5, 1993	moderately impaired
10	34	AN0409	Six Mile Run	Canal Rd	Blackwells Mills	Oct 5, 1993	moderately impaired
10	34	AN0410	Millstone R	Blackwells Mills Rd	Blackwells Mills	Aug 10, 1988	moderately impaired
10	34	AN0410	Millstone R	Blackwells Mills Rd	Blackwells Mills	Jul 23, 1990	moderately impaired
10	34	AN0411	Royce Bk	Rt 206	Bloomingtondale	Nov 10, 1993	moderately impaired
10	34	AN0412	Royce Bk Br	Rt 206	Hillsborough Twp	Nov 10, 1993	moderately impaired
10	34	AN0413	Royce Bk	Rt 533	Manville	Nov 10, 1993	moderately impaired
10	34	AN0414	Millstone R	abv Raritan R conf	Manville	Jul 11, 1990	moderately impaired